IN THE CLAIMS

1. (Currently Amended) A method of providing printability analysis for a defect on a physical mask, the method comprising:

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generating a simulated wafer image of the physical mask;

generating a simulated wafer image of a reference mask, the reference mask corresponding to a defect-free physical mask;

identifying a first feature proximate to the defect on the simulated wafer image of the physical mask;

identifying a second feature on the simulated wafer image of the reference mask, the second feature corresponding to the first feature; and

~~comparing the first and second features~~ computing critical dimension deviations including the first and second features to provide the printability analysis.

2. (Currently Amended) The method of Claim 1, wherein ~~comparing~~ computing includes determining a first critical dimension of the first feature and a second critical dimension of the second feature.

3. (Currently Amended) The method of Claim 2, wherein ~~comparing~~ computing includes calculating a relative critical dimension deviation for the first and second features.

4. (Original) The method of Claim 3, wherein calculating the relative critical dimension deviation includes subtracting the second critical dimension from the first critical dimension, and dividing a resulting value by the second critical dimension.

5. (Original) The method of Claim 3, further including:

identifying a first plurality of features proximate to the defect on the simulated wafer image of the physical mask;

identifying a second plurality of features on the simulated wafer image of the reference mask, the second plurality of features corresponding to the first plurality of features; and

calculating a plurality of relative critical dimension deviations for the first and second plurality of features.

6. (Original) The method of Claim 5, further including determining the largest of the plurality of relative critical dimension deviations, thereby providing a maximum critical dimension deviation.

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7. (Currently Amended) The method of Claim 1, further including:

identifying a third defect-free feature on the simulated wafer image of the physical mask;

identifying a fourth feature on the simulated wafer image of the reference mask, the fourth feature corresponding to the third feature; and

~~comparing~~ computing critical dimension deviations including the third and fourth features.

8. (Currently Amended) The method of Claim 7, wherein ~~comparing~~ computing the third and fourth features includes determining a first critical dimension of the third feature and a second critical dimension of the fourth feature.

9. (Currently Amended) The method of Claim 8, wherein ~~comparing~~] computing includes calculating a critical dimension deviation for the first and second features.

10. (Original) The method of Claim 9, wherein calculating the critical dimension deviation includes subtracting the first critical dimension from the second critical dimension, and dividing a resulting value by the second critical dimension.

11. (Original) The method of Claim 9, further including calculating the critical dimension deviation for N defect-free features on the simulated wafer image of the physical mask, wherein N is an integer equal to or greater than two.

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12. (Orignal) The method of Claim 11, wherein the critical dimension deviation for each defect-free feature is added, and a resulting value is divided by N, thereby providing an average critical dimension deviation.

13. (Currently Amended) A method of providing printability analysis for a defect on a physical mask, the method comprising:

generating a simulated wafer image of the physical mask;

generating a simulated wafer image of a reference mask, the reference mask corresponding to a defect-free physical mask; ~~and~~

~~comparing the simulated wafer images of the physical and reference masks to provide the printability analysis~~

computing an average critical dimension deviation for a defect-free area of the physical mask using the simulated wafer images of the physical and reference masks;

computing a maximum critical dimension deviation for a defect area of the physical mask' using the simulated wafer images of the physical and reference masks; and

using the average critical dimension deviation and the maximum critical dimension deviation to provide the printability analysis.

14. (Currently Amended) The method of Claim 13, further including determining a defect severity score based on the step of ~~comparing~~ using.

15. (Currently Amended) The method of Claim 13, ~~wherein the step of comparing includes:~~

~~generating a first process window based on a first feature on the simulated wafer image of the physical mask;~~

~~generating a second process window based on a second feature on the simulated wafer image of the reference mask, wherein the second feature corresponds to the first feature; and~~

~~determining a common process window based on the first and second process windows~~ further including determining a tolerance for critical dimension changes.

16. (Currently Amended) The method of Claim 15, wherein ~~the common process window is based on a plot of exposure deviation versus defocus~~ using includes using the tolerance for critical dimension changes to provide the printability analysis.

17. (Currently Amended) The method of Claim 15, wherein ~~the common process window is based on a plot of exposure latitude versus depth of focus~~ using includes determining the number of exposures analyzed.

18. (Currently Amended) A method of providing printability analysis for a defect on a physical mask, the method comprising:

generating a simulated wafer image of the physical mask;

identifying a first feature on the simulated wafer image affected by the defect;

identifying a second feature on the simulated wafer image unaffected by the defect, wherein the first and second features

have substantially the same critical dimension in the absence of the defect; ~~and~~

~~comparing the first and second features~~

computing a first critical dimension deviation for a defect-free area of the physical mask using the simulated wafer images of the physical and reference masks;

computing a second critical dimension deviation for a defect area of the physical mask using the simulated wafer images of the physical and reference masks; and

using the first and second critical dimension deviations to provide the printability analysis.

19. (Currently Amended) The method of Claim 18, ~~wherein comparing includes:~~

~~providing a first process window for the first feature;~~

~~providing a second process window for the second feature; and~~

~~determining a common process window based on the first and second process windows~~ further including determining a tolerance for critical dimension changes.

20. (Currently Amended) The method of Claim 19, wherein ~~the common process window is based on a plot of exposure deviation versus defocus~~ using includes using the tolerance for critical dimension changes to provide the printability analysis.

21. (Currently Amended) The method of Claim 19, wherein ~~the common process window is based on a plot of exposure latitude versus depth of focus~~ using includes determining the number of exposures analyzed.

22. (Currently Amended) A method of fabricating a physical mask, the method comprising:

designing an integrated circuit;

creating mask design data for a layer of the integrated circuit;

manufacturing a physical mask conforming to the mask design data;

inspecting the physical mask based on a simulated wafer image of the physical mask and a simulated wafer image of a reference mask, wherein the reference mask corresponds to a defect-free physical mask, wherein inspecting comprises:

computing an average critical dimension deviation for a defect-free area of the physical mask using the simulated wafer images of the physical and reference masks;

computing a maximum critical dimension deviation for a defect area of the physical mask using the simulated wafer images of the physical and reference masks; and

using the average critical dimension deviation and the maximum critical dimension deviation to provide printability analysis; and

determining whether the physical mask passes inspection based on the printability analysis.

23. (Currently Amended) The method of Claim 22, wherein inspecting includes:

~~comparing the simulated wafer images of the physical and reference masks~~ using a tolerance for critical dimension changes to provide printability analysis.

24. (Currently Amended) The method of Claim 23, wherein inspecting further includes determining a defect severity score based on ~~the step of comparing~~ using the average critical

dimension deviation, the maximum critical dimension deviation, and the tolerance for critical dimension changes.

25. (Currently Amended) The method of Claim ~~23~~ 22, wherein ~~inspecting further includes:~~

~~generating a first process window based on a first feature on the simulated wafer image of the physical mask;~~

~~generating a second process window based on a second feature on the simulated wafer image of the reference mask, wherein the second feature corresponds to the first feature; and~~

~~determining a common process window based on the first and second process windows~~ using includes determining the number of exposures analyzed.

26. (Currently Amended) The method of Claim 25, wherein the ~~common process window is based on a plot of exposure deviation versus defocus~~ printability analysis includes a defect severity score for at least one exposure.

27. (Currently Amended) The method of Claim 25, wherein the ~~common process window is based on a plot of exposure latitude versus depth of focus~~ printability analysis includes a defect severity score for multiple exposures.

28. (Currently Amended) A method of generating a defect severity score for a defect on a mask, the method comprising:

providing two-dimensional analysis on the defect and a first feature on the mask, the first feature being proximate to the defect;

providing a first wafer image of the mask; and

providing defect analysis on a second feature on the wafer image, the second feature corresponding to the first feature

being simulated, wherein providing defect analysis includes computing various critical dimension deviations based on the first and second features.

29. (Currently Amended) The method of Claim 28, further including:

identifying a third feature on a defect-free reference image of the mask, the third feature representing the first feature;

providing a second wafer image of the reference image, the second wafer image including a fourth feature, the fourth feature corresponding to the third feature being simulated; and

providing defect analysis on the fourth feature, wherein providing defect analysis includes computing various critical dimension deviations based on the first, second, third, and fourth features.

30. (Original) The method of Claim 29, wherein providing defect analysis on the second and fourth features includes comparing critical dimensions on the second and fourth features.

31. (Original) The method of Claim 30, wherein providing defect analysis further includes determining changes of the critical dimensions at different exposures.

32. (Original) The method of Claim 31, wherein providing defect analysis further includes determining a maximum critical dimension change for each exposure.

33. (Original) The method of Claim 32, wherein providing defect analysis further includes calculating a relative maximum critical dimension change for each exposure.

34. (Original) The method of Claim 29, further including providing a calibration between the first and second wafer images.

35. (Currently Amended) A system for analyzing a defect on a physical mask, the system comprising:

an inspection tool for generating a mask image from the physical mask and a reference image from a reference mask;

a wafer image generator for simulating a stepper mask image from the mask image and a stepper reference image from the reference image; and

a defect printability analysis generator for comparing the stepper mask image and the stepper reference image,

wherein the defect printability analysis generator determines an average critical dimension deviation for a defect-free area on the physical mask using the stepper mask image and the stepper reference image,

wherein the defect printability analysis generator determines a maximum critical dimension deviation for a defect area on the physical mask using the stepper mask image and the stepper reference image, and

wherein the defect printability analysis generator uses the average critical dimension deviation and the maximum critical dimension deviation to provide printability analysis of the defect.

36. (Original) The system of Claim 35, further including a critical region identification generator for determining if the defect is located in a critical region of the physical mask, the critical region identification generator providing an output to the defect printability analysis generator.

37. (Original) The system of Claim 35, further including a bitmap editor for receiving data from the defect printability analysis generator and providing a suggested repair to the defect.

38. (Original) The system of Claim 37, further including a mask repair tool for responding to the suggested repair.

39. (Original) The system of Claim 38, wherein the system automatically analyzes the defect and the mask repair tool automatically responds to the suggested repair.

40. (Original) The system of Claim 35, wherein the system automatically analyzes the defect and the defect printability analysis generator automatically provides a severity score for the defect.

41. (Currently Amended) A system for generating a defect severity score for a defect on a physical mask, the system comprising:

means for generating a first image of a feature on the physical mask proximate to the defect and a second image of the feature on the reference image;

means for simulating a first wafer image of the first image and a second wafer image of the second image; and

means for generating the defect severity score based on the first and second wafer images,

wherein the means for generating determines an average critical dimension deviation for a defect-free area on the physical mask using the first and second wafer images,

wherein the means for generating determines a maximum critical dimension deviation for a defect area on the physical mask using the first and second wafer images, and

wherein the means for generating uses the average critical dimension deviation and the maximum critical dimension deviation to provide the defect severity score.

42. (Original) The system of Claim 41, further including means for identifying if the defect is within a critical region, wherein the means for identifying provides data to the means for generating the defect severity score.

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43. (Original) The system of Claim 41, wherein the means for simulating includes means for responding to a plurality of lithographic conditions.

44. (Currently Amended) A physical mask comprising:

at least one defect being modified based on a first average critical dimension deviation and a first maximum critical dimension deviation provided from analyzing a simulated wafer image of the physical mask and a simulated wafer image of a reference mask, the reference mask corresponding to a defect-free physical mask~~; and~~

~~at least one defect being unmodified based on analyzing the simulated wafer image of the physical mask and the simulated wafer image of the reference mask~~.

45. (Currently Amended) A physical mask comprising:

at least one irregularity being modified based on a first average critical dimension deviation and a first maximum critical dimension deviation provided from analyzing a simulated wafer image of the physical mask and a simulated wafer image of

a reference mask, the reference mask corresponding to a defect-free physical mask ~~; and~~

~~at least one irregularity being unmodified based on analyzing the simulated wafer image of the physical mask~~.

46. (Currently Amended) A physical mask comprising:

at least one feature being modified based on a first average critical dimension deviation and a first maximum critical dimension deviation provided by comparing a simulated wafer image of the physical mask and a simulated wafer image of a reference mask, the reference mask corresponding to a defect-free physical mask~~; and~~

~~at least one feature being unmodified based on comparing the simulated wafer image of the physical mask and the simulated wafer image of the reference mask~~.

47. (Currently Amended) An integrated circuit fabricated using a physical mask comprising:

at least one feature being modified based on a first average critical dimension deviation and a first maximum critical dimension deviation provided by comparing a simulated wafer image of the physical mask and a simulated wafer image of a reference mask, the reference mask corresponding to a defect-free physical mask~~; and~~

~~at least one feature being unmodified based on comparing the simulated wafer image of the physical mask and the simulated wafer image of the reference mask~~.

48. (Currently Amended) An integrated circuit fabricated using a physical mask made by the following steps:

generating a simulated wafer image of the physical mask;

generating a simulated wafer image of a reference mask, the reference mask corresponding to a defect-free physical mask; ~~and~~

~~comparing the simulated wafer images of the physical and reference masks~~ computing an average critical dimension deviation for a defect-free area of the physical mask using the simulated wafer images of the physical and reference masks;

computing a maximum critical dimension deviation for a defect area of the physical mask using the simulated wafer images of the physical and reference masks;

using the average critical dimension deviation and the maximum critical dimension deviation to determine whether to repair the physical mask; and

fabricating the integrated circuit using the physical mask.

49. (Currently Amended) Computer software for analyzing a defect on a first mask, the software including:

means for generating a simulated wafer image of the first mask;

means for generating a simulated wafer image of a second mask, the second mask corresponding to a defect-free first mask; and

means for ~~comparing the simulated wafer images of the first and second masks to analyze printability of the defect~~ computing an average critical dimension deviation for a defect-free area of the physical mask using the simulated wafer images of the physical and reference masks;

means for computing a maximum critical dimension deviation for a defect area of the physical mask using the simulated wafer images of the physical and reference masks; and

means for using the average critical dimension deviation and the maximum critical dimension deviation to provide printability analysis regarding the defect.

50. (Currently Amended) The computer software of Claim 49, wherein the means for ~~comparing~~ using includes:

means for generating a defect severity score for the defect.

51. (Original) The computer software of Claim 49, further including:

means for providing repair information on the defect based on the printability.

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52. (Original) The computer software of Claim 50, further including:

means for providing repair information on the defect based on the defect severity score.

53. (Currently Amended) A method of inspecting a physical mask, the physical mask including a defect, the method comprising the following steps:

generating a simulated wafer image of the physical mask;

generating a simulated wafer image of a reference mask, the reference mask corresponding to a defect-free physical mask; ~~and~~

~~comparing the simulated wafer images of the physical and reference masks to provide information on the defect~~

computing an average critical dimension deviation for a defect-free area of the physical mask using the simulated wafer images of the physical and reference masks;

computing a maximum critical dimension deviation for a defect area of the physical mask using the simulated wafer images of the physical and reference masks; and

using the average critical dimension deviation and the maximum critical dimension deviation to provide printability analysis of the defect.

54. (Original) The method of Claim 53, wherein comparing includes generating a defect severity score.

55. (Original) The method of Claim 53, further including: communicating the information on the defect to a mask repair tool.

56. (Original) The method of Claim 54, further including: communicating the defect severity score to a mask repair tool.

57. (Original) The method of Claim 53, wherein the reference mask includes one of the following: a simulated image of a layout of the physical mask, a defect-free area of the physical mask having a substantially identical pattern to that including the defect, and a simulated image of the physical mask as the physical mask is processed in manufacturing.

58. (Original) The method of Claim 53, wherein generating the simulated image of the physical mask compensates for image distortions created during image capture.

59. (New) A physical mask comprising:

at least one defect being unmodified based on a first average critical dimension deviation and a first maximum critical dimension deviation provided from analyzing a simulated wafer image of the physical mask and a simulated wafer image of the reference mask, the reference mask corresponding to a defect-free physical mask.

60. (New) The physical mask of Claim 59, further including at least one defect being modified based on a second average critical dimension deviation and a second maximum critical dimension deviation provided from analyzing the simulated wafer images of the physical mask and the reference mask.

61. (New) The physical mask of Claim 44, further including at least one defect being unmodified based on a second average critical dimension deviation and a second maximum critical dimension deviation provided from analyzing the simulated wafer images of the physical mask and the reference mask.

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62. (New) A physical mask comprising:

at least one irregularity being unmodified based on a first average critical dimension deviation and a first maximum critical dimension deviation provided from analyzing a simulated wafer image of the physical mask and a simulated wafer image of a reference mask, the reference mask corresponding to a defect-free physical mask.

63. (New) The physical mask of Claim 60, further including at least one irregularity being modified based on a second average critical dimension deviation and a second maximum critical dimension deviation provided from analyzing the simulated wafer images of the physical mask and the reference mask.

64. (New) The physical mask of Claim 45, further including at least one irregularity being unmodified based on a second average critical dimension deviation and a second maximum critical dimension deviation provided from analyzing the

simulated wafer images of the physical mask and the reference mask.

65. (New) A physical mask comprising:

at least one feature being unmodified based on a first average critical dimension deviation and a first maximum critical dimension deviation provided by comparing a simulated wafer image of the physical mask and a simulated wafer image of a reference mask, the reference mask corresponding to a defect-free physical mask.

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66. (New) The physical mask of Claim 65, further including at least one feature being modified based on a second average critical dimension deviation and a second maximum critical dimension deviation provided by comparing the simulated wafer images of the physical mask and the reference mask.

67. (New) The physical mask of Claim 46, further including at least one feature being unmodified based on a second average critical dimension deviation and a second maximum critical dimension deviation provided by comparing the simulated wafer images of the physical mask and the reference mask.

68. (New) An integrated circuit fabricated using a physical mask comprising:

at least one feature being unmodified based on a first average critical dimension deviation and a first maximum critical dimension deviation provided by comparing a simulated wafer image of the physical mask and a simulated wafer image of a reference mask, the reference mask corresponding to a defect-free physical mask.

69. (New) The integrated circuit of Claim 68, wherein the physical mask further includes at least one feature being modified based on a second average critical dimension deviation and a second maximum critical dimension deviation provided by comparing the simulated wafer images of the physical mask and the reference mask.

70. (New) The integrated circuit of Claim 47, wherein the physical mask further includes at least one feature being unmodified based on a second average critical dimension deviation and a second maximum critical dimension deviation provided by comparing the simulated wafer images of the physical mask and the reference mask.